(12) UK Patent Application (19) GB (11) 2 257 913 (13) A

(43) Date of A publication 27.01.1993

(21) Application No 9208091.0

(22) Date of filing 13.04.1992

(30) Priority data
(31) 918854 (32) 14.06.1991 (33) KR

(51) INT CL[5]
A61B 17/58

(52) UK CL (Edition L)
A5R RFB RX4

(56) Documents cited
GB 2017502 A EP 0242267 A EP 0009327 A

(58) Field of search
UK CL (Edition K) A5R RFB
INT CL[5] A61B
Online database: WPI

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(54) Bone plate

(57) A bone plate (1) for internal fixation of a fracture has a plurality of screw holes (2) pierced through from the front side (3) to the rear side (4) with some space longitudinally therebetween. A plurality of transverse wire holes (5) are pierced from one lateral side (6) to the other in spaces between the screw holes.

FIG.1

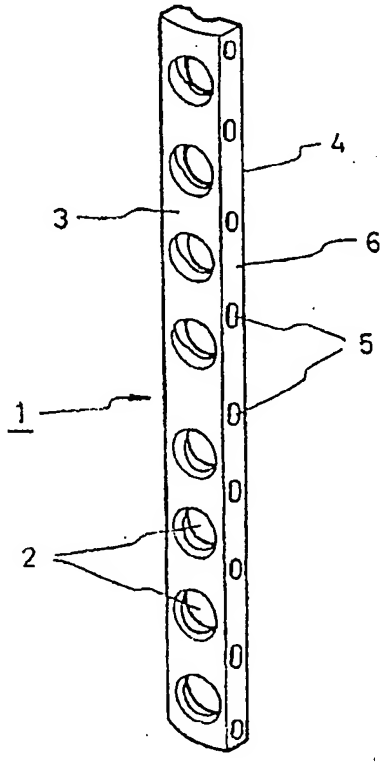

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FIG.1

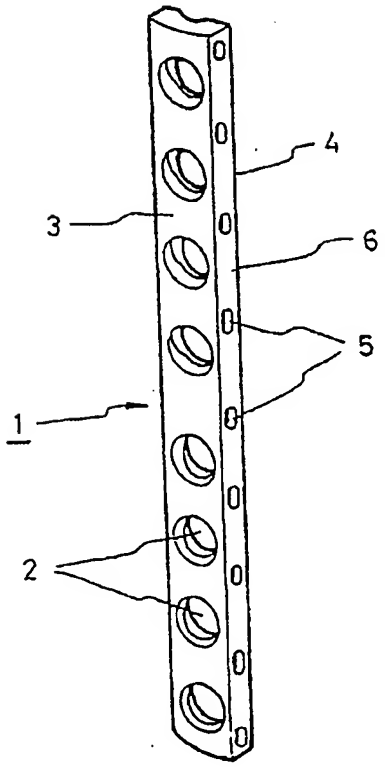


FIG.2

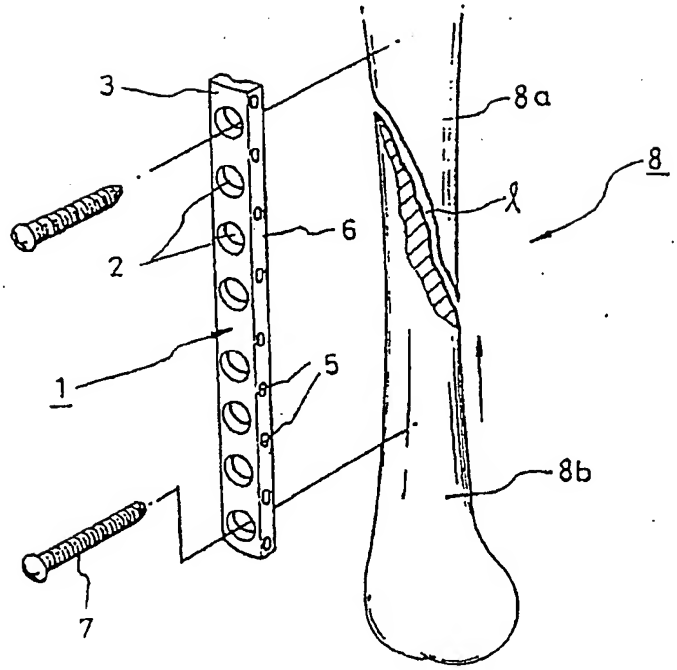


FIG.3

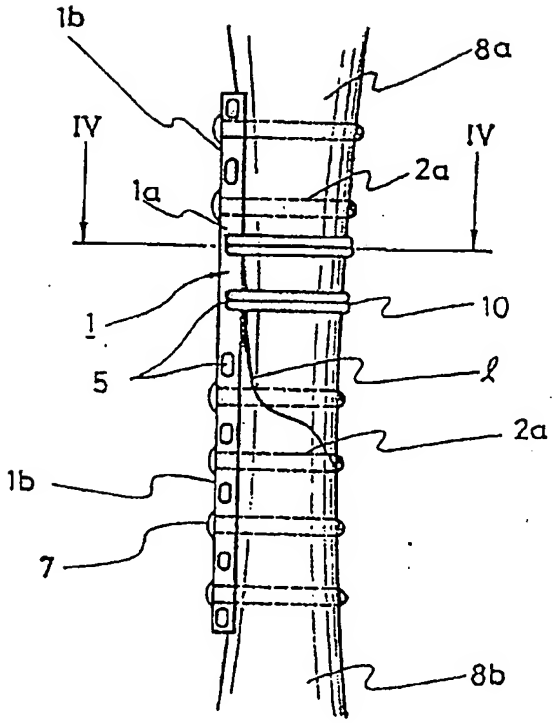


FIG.4

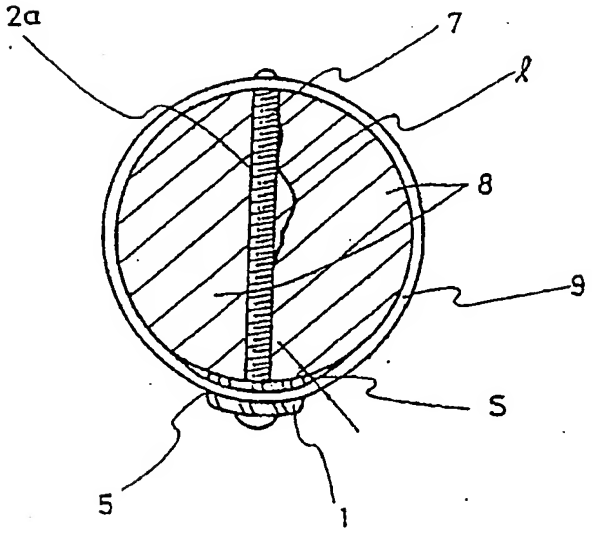


FIG. 5

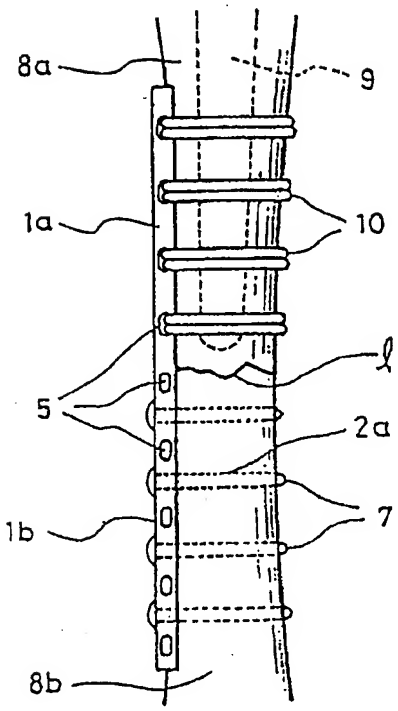

8a
9
1a
10
ℓ
5
2a
7
1b
8b

FIG. 6

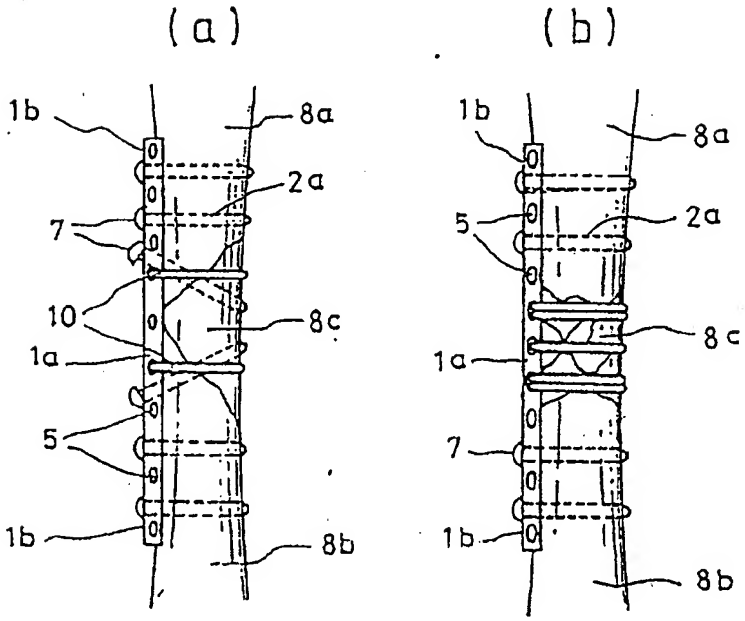

(a)
(b)
1b
8a
2a
7
10
8c
1a
5
1b
8b
1b
8a
5
2a
8c
1a
7
1b
8b

FIG.7

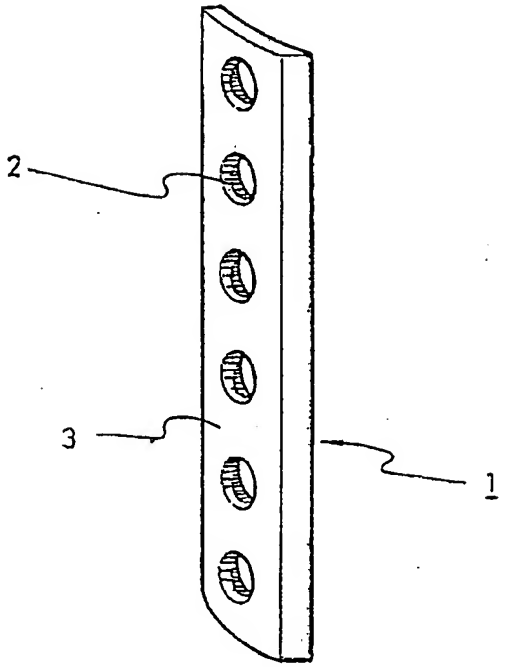


FIG.8

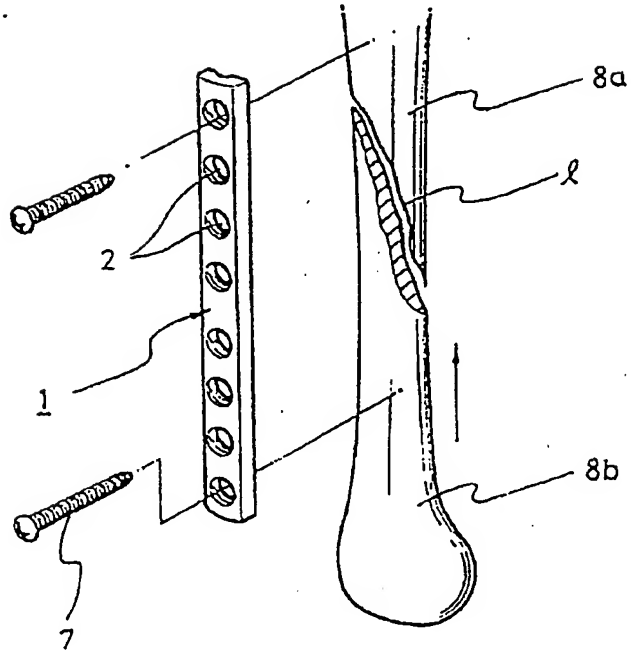


FIG.9

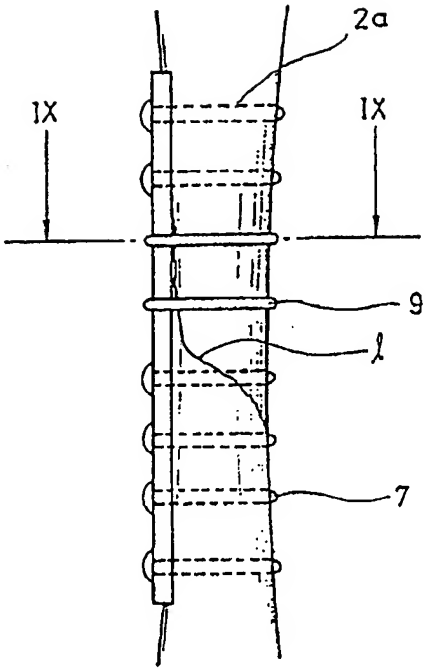


FIG.10

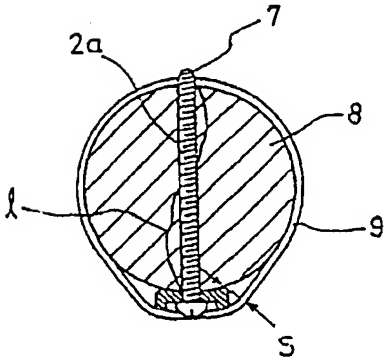
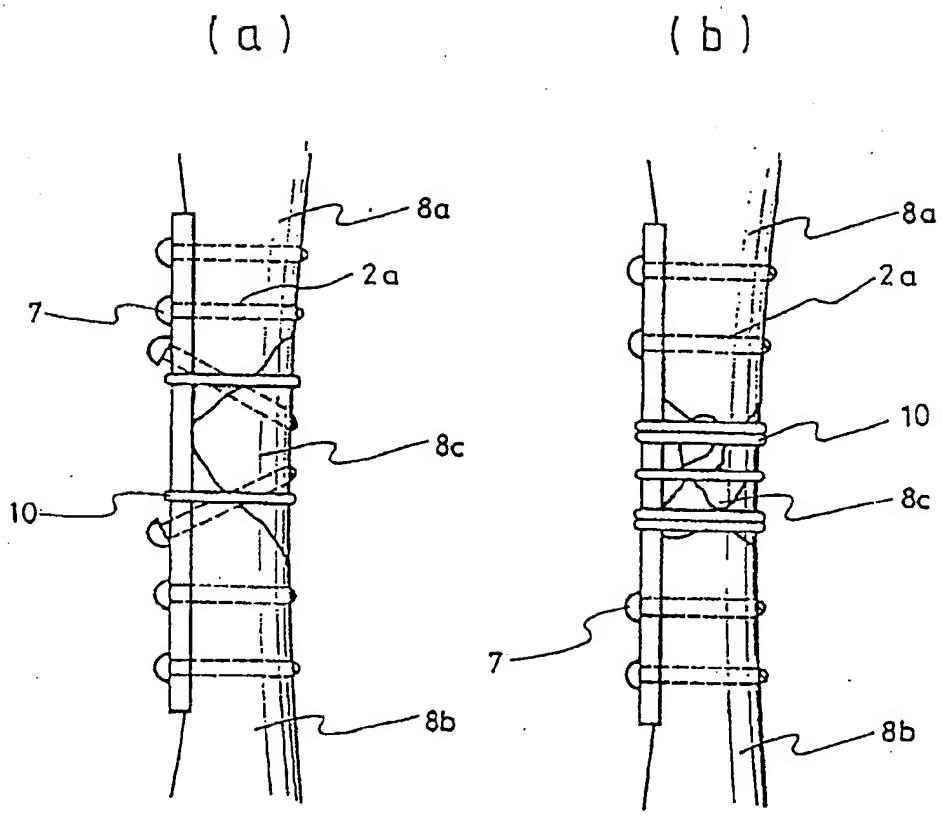


FIG.11



WIRING BONE PLATE FOR INTERNAL FIXATION OF FRACTURE

FIELD OF THE INVENTION

The present invention relates to a bone plate used for fracture treatment, particularly to an improved bone plate which enables fixation of a bone in the case of a wedge or comminuted fracture.

BACKGROUND OF THE INVENTION

As is well known, several methods of fracture treatment have been developed. Until middle of 20th Century, conservative treatment prevailed. With the advancement of anesthesiology, antibiotics and biomechanics, the conservative treatment has been replaced by operative treatment in many case. The operative treatment has definite advantages compared with conserative treatment because accurate reduction and early mobilization minimize fracture complications and promote healing.

In planning the operation, the surgeon must decide which material to use for internal fixation. There are several kinds of internal fixator. But until now, plating with screws is most often the first choice, followed by intramedullary nailing.

With the aid of biomechanical research, the bone plate has gone through substantial development recently. The plate has become variable in shape and design, more inert to the human body, and better in strength and endurance, thereby making it easier to perform the operation. Nowadays, the majority of the plates are designed for self compression with sufficient strength and variable shape using several kinds of alloy, such as Stainless Steel, Vitallium, Titanium and so on.

The surgeon can select nearly every length, width and shape of the plate, such as wide, narrow, T- shape, L- shape, condylar, anatomical, blade, barrel, and so on.

However, in spite of these various shapes and designs, some difficulties and problems still exist in performing internal fixation with the plate in certain cases. All of these plates are designed to be fixed to the bone with screws. However, the situation sometimes occurs where a surgeon is unable to insert the screws. These situations include comminuted fracture, wedge fracture, fracture aligned in the same direction as the direction of the screw insertion, and a fracture distal to the hip prosthesis or intramedullary nailing. In these cases, the surgeon requires additional wiring for rigid fixation.

If wiring is needed, there are two practical operative procedures : one is wiring first and the other is wiring last. To reduce the fracture, it can be rigidly bound using only the wire because the wire does not be move easily on the bare bone.

Then, as the next step to fix the fracture, the plate is placed on the bone on which the wire had been wound. However, the plate cannot be in tight contact with the bone because contact of the plate with the bone is interrupted by the wires disposed between the plate and the bone.

Therefore, in actual operative procedure, first the plate is placed on the broken bone so that the plate is in tight contact with the bone, then a wire is wound over the plate and the bone toghter.

However, wiring over the plate also has many problems using conventional self compression plate. The first problem is that rigid fixation cannot be attained because of the thickness and hardness of the plate. As shown in Fig 10, the large gap (s) between the bone and the plate inhibits rigid fixation. The wire and the plate can move seperately with respect to each other. This motion results from disengagement among the wire, the plate and the bone, which has a variable diameter of the bone along its longitudinal direction, especially in the metaphyseo-diaphyseal junction. This slippage of wire causes instability of the fracture site and results in delayed union or non-union.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved wiring bone plate which can eliminate all of the above-noted drawbacks and can firmly fix the bone plate onto the fracture, even comminuted fracture, wedge fracture, fracture aligned in the same direction as that of the screw insertion, and fracture distal to a hip prosthesis or intramedullary nailing.

To achieve the above object in a preferred embodiment, the wiring bone plate has a plurality of screw holes pierced through from the front surface to rear surface of a long metal strip with some space longitudinally therebetween, and a plurality of transverse wire holes pierced through from one side surface to another side surface in each of the spaces between the screw holes.

The wire hole can hold the wire inserted into it, thus enable the bone plate to be fixed onto the fracture satisfactorily, even if screw fixation is impossible, such as in the wedge fracture, the comminuted fracture, and fracture with prostheis or intramedullary nailing.

Another advantage is that it makes the operative procedure easier by maintaining the reduction without intervening screw insertion.

The invention is defined with more precision in the appended claims to which reference should be made.

THE BRIEF DESCRIPTION OF DRAWINGS

The present invention will now be described in geater detail, by way of example, with reference to the drawings in which :

Fig 1 is a perspective new of the wiring bone plate embodying the present invention,

Fig 2 is a drawing of the use of the wiring bone plate embodying the present invention prior to an operation,

Fig 3 is a side-sectional view of the broken bone fixed with the wiring bone plate, screws and the wire, after an operation.

Fig 4 is a transverse sectional view taken along line IV-IV in Fig 3,

Fig 5 is a drawing of fracture fixation using the bone plate embodying the present invention when the fracture occured distal to the hip prosthesis,

Fig 6a and 6b are drawings showing internal fixation using the bone plate embodying the present invention in case of wedge (6a) and comminuted (6b) fracture,

Fig 7 is a perspective view of the bone plate according to the prior art,

Fig 8 is a drawing showing the use of the the bone plate according to the prior art before an operation,

Fig 9 is a side elevation view showing wiring method using a prior art bone plate in case of multiplane fracture line(4),

Fig 10 is a transverse section view along with line I-I in Fig 9,

Fig 11a and 11b are side elevation views showing wiring method using a prior art bone plate in the case of wedge (a) and comminuted (b) fracture.

DETAILED DESCRIPTION OF THE INVENTION

Fig 1. is perspective view of the wiring bone plate embodying the present invention. The plate 1 is formed as a long metallic strip composed of a plurality of screw holes 2 pierced through from the front side 3 to rear side 4 with some space longitudinally thereof, and a plurality of transverse wire holes 5 pierced through the both lateral side 6 in each of spaces between the screw holes 2. That is, this plate 1 has additional transverse holes 5 for wire passage between the screw holes 2 on the conventional self compression bone plate 1.

Fig 2. shows schematic drawing before applying this new plate 1 to the fracture site. The plate 1 whose length is long enough for rigid fixation is placed on the bone 8 across the fracture line ℓ. Usually three (3) to four (4) screw fixation should be performed proximal 8a and distal 8b to the fracture line ℓ. Thus, in simple fracture there is no problem stabilizing the broken bone 8 using only the plate 1 and the screws 7. However, in certain cases, only with the plate 1 and the screw7,

the broken bone 8 can not be fixed rigidly.

Fig 3 and 4 show one example of the case where the broken bone 8 cannot be rigidly fixed only the plate 1 and the screws 7. In case of spiral and comminuted fracture, the direction of some part of the fracture line ℓ is same as that of the screw insertion and the fragments 8c are too small to make screw holes therewithin.

In surch cases, during drilling and screw insertion, the fracture results in more fragmentation, and finally, rigid fixation cannot be attained.

Fig 5 is a drawing of fracture fixation using the bone plate 1 embodying the present invention in a fracture distal 8b to the hip prosthesis or a fracture with an intramedullary nail 9. Screw fixation is impossible because of the intramedullary nail 9 in the bone 8. In this case, by using both a wire 10 and the wiring bone plate 1 embodying the present invention, the fracture 8 can be rigidly fixed without screw fixation.

The wire 10 is inserted through the wire hole 5 of the plate 1, wound around the bone 8 and tightly tied to it. Then, since the gap (s) between the bone 8 and the plate 1 is short and the wire 10 is inserted into the wire hole 5 of the plate 1, the tension of the wire 10 can be kept constant and no wire slippage is permitted.

Fig 6a and 6b are postoperative drawings using the wiring plate 1 embodying the present invention in case of the wedge and comminuted fracture. Generally during operative procedure, after reducing comminuted fracture, the fracture fragment 8c must be cramped with a bone cramp or a bone forcep so as to maintain reduction of the comminuted fracture fragment 8c. Then, in the case of using the prior art bone plate, in order to drill screw holes 2a in the bone 8 and fix the plate 1 onto a reduced fracture 8 with the screw 7, the cramp or the forcep must be released. At this time, the setting of reduction is lost.

By using the wiring plate 1 embodying the present invention, however, it is not

necessary to drill the screw holes 2a in the reduced fracture to fix the plate 1 onto the fracture 8. The wiring bone plate 1 can hold the fracture 8 in a reduced state firmly by only wiring without releasing clamping of the bone clamp or the bone forcep. As shown in Fig 5, the portion 1a of the plate 1 placed over the proximal part 8a of the fracture 8(into which the screw holes 2a can not be drilled because of the intramedullary nail 9 inserted by the hip prosthesis) is tied up by means of only the wire 10, and another portion 1b of the plate 1 placed over the distal part 8b of the fracture is fixed up by means of the screws 7.

In addition, as shown in Fig 6, sometimes the screw hole 2a cannot be drilled in the comminuted part 8c of the fracture. In this case, the comminuted part 8c is also tied up with the bone plate 1 by means of only the wire 10, and both ends of the comminuted part 8c of the fracture are fixed to the bone plate 1 by means of the screws 7.

Since the wire 10 is inserted through the wire hole 5 of the plate 1 and wound around the circumference of the broken bone 8, the plate 1 is tightly contacted with the fracture 8. If the wire 10 is to be moved along the bone 8, the plate 1 into which the wire 10 is inserted through the wire hole 5 must be simultanously moved. Therefore, the wire 10 cannot be moved along the longitudinal direction of the bone 8, and the wire 10 can hold both the plate 1 and the fracture 8 with constant engagement force.

The size of the wire hole 5 can be sufficient for double wiring of a broad plate or single wiring of a narrow plate, but not too large to weaken the strength of the plate. This wiring plate 1 has many advantages. The first is that rigid fixation can be attained as the gap (s) between the plate 1 and the bone 8 is decreased. The second is that wiring can be applied everywhere, because there is no wire slippage, although the diameter of bone 8 varies substuntially along the longtudinal direction of the bone 8. The third is that this plate 1 can be fixed more rigidly with the femur fracture with the hip prosthesis or medullary nailing than with any

other prior bone plate.

In addition to the foregoing, this bone plate 1 has one more advantage when performing internal fixation. At the first step of operative procedure, the fracture fragment 8c is reduced. At the second step, the bone plate 1 is fixed with the screws 7 while maintaining the reduced state of the fracture fragment 8c with a bone forcep or a bone clamp But these apparatuses sometimes hinder the screw insertion because they are very bulky. Transient release of there apparatuses for screw fixation causes lossof reduction especially in case of comminuted fracture. When using the bone plate 1 embodying the present invention, there can be excellent maintenance of reduction by rigid wiring without the bone clamp or the bone forcep. So, without using the bone clamp or the bone forcep, the plate 1 can be easily fixed onto the broken bone 8 with only the wire 10 in the portion of the comminuted fracture and fracture with a prostheis or intramedullary nail, and the other part of the broken bone except the above portion is fixed using only the screws 7.

What is claim is

1. A long metallic wiring bone plate for internal fixation of a fracture comprised of a front and rear surface and lateral sides, a plurality of screw holes pierced through from the front suface to the rear surface with some space therebetween characterized in that, a plurality of transverse wire holes are pierced through from on lateral side of the plate to the other lateral side of the plate in the spaces between the screw holes.

2. A wiring bone plate for internal fixation of fracture according to claim 1, wherein the screw hole is sized sufficient for double wiring in a broad plate but not too large as so to weaken the strength of the plate .

3. A wiring bone plate for internal fixation of fracture according to claim 1, wherein the screw hole is sized for single wiring in narrow plate, but not too large so as to weaken strength of the plate.

4. A method of reducing and internally fixing a bone fracture comprising the steps of :

providing a metallic wiring bone plate comprised of a front and a rear surface and lateral sides, a plurality of screw holes pierced through from the front surface to the rear surface with some space therebetween characterzed in that, a plurality of transverse wire holes are pierced through from one lateral side of the plate to the other lateral side of the plate in the spaces between the screw holes ; inserting wire through the transverse wire holes, winding said wire around the bone and tying the wire to the bone.

5. The method of claim 4 further compring the step of screwing screws through t__ screw holes and into the bone.

6. A bone plate for internal fixation of a fracture comprising front and rear surfaces and side surfaces, a plurality of screw holes pierced through from the front surface to the rear surface and at least one wire hole pierced through from one side surface to the other side surface.

7. A bone plate for internal fixation of a fracture substantially as herein described with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number
9208091.0

Relevant Technical fields

(i) UK Cl (Edition K) A5R (RFB)

(ii) Int CL (Edition 5) A61B

Search Examiner
R J WALKER

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE: WPI

Date of Search
22 JUNE 1992

Documents considered relevant following a search in respect of claims 1-3 AND 6

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2017502 A (DALL ET AL) Note through holes 24	1-3,6
X	EP 0242267 A (PETERS) Note through holes 5-10	1-3,6
X	EP 0009327 (HUDDLESTON) See Figure 2 and page 10 lines 12-17	1-3,6

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

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